

80. (Amended) A surface modification method for filling areas enclosed by banks in a substrate with a liquid thin film material, comprising:
performing a series of surface modification treatments uniformly over an entire surface of said substrate whereon said banks are formed; and
raising a non-affinity of bank surfaces for said liquid thin film material relative to that of surfaces between said banks.

REMARKS

Claims 1-80 are pending. By this Amendment, claims 1-13, 15-24, 26, 28-47, 49-68 and 70-80 are amended.

The attached Appendix includes marked-up copies of each rewritten claim (37 C.F.R. §1.121(c)(1)(ii)).

Applicants appreciate the courtesies extended to Applicants' representative during the March 1, 2002 telephone interview.

I. CONSIDERATION OF APPLICANT'S INFORMATION
DISCLOSURE STATEMENT IS RESPECTFULLY REQUESTED

The Office Action indicates that the Information Disclosure Statement fails to comply with 37 C.F.R. 1.98(a)(3). Attached hereto are English language abstracts for the documents listed in the Information Disclosure Statement. Applicants respectfully request that the references in the Information Disclosure Statement be considered.

II. THE CLAIMS SATISFY THE REQUIREMENT
OF 35 U.S.C. §112, FIRST AND SECOND PARAGRAPHS

The Office Action rejects claims 1-29, 48, 69-71, 73, and 75-79 under 35 U.S.C. §112 first and second paragraphs. This rejection is respectfully traversed.

Applicants amend claims 1-13, 15-24, 26, 28-47, 49-68 and 70-80 to obviate the rejections under 35 U.S.C. §112 first and second paragraphs. Furthermore, Applicants believe that the specification describes the subject matter of the invention in such a way as to enable one skilled in the art to make and/or use the invention.

III. CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



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Attachments:

Appendix
Petition for Extension of Time
English language abstracts
PTO form (1449)

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APPENDIX

Changes to Claims:

Claims 1-13, 15-24, 26, 28-47, 49-68 and 70-80 are amended.

The following are marked-up versions of the amended claims:

1. (Amended) A thin film patterning substrate, used for forming thin films into patterns by an ink jet method, comprising:

on a surface whereof are formed banks of a prescribed height and areas to be coated, partitioned by said banks, ~~characterized in that:~~

when said banks having a width of said bank is made a (μm), a height thereof is made c (μm), a width of said areas to be coated is made b (μm), and an ink jet liquid droplet diameter of liquid material forming the thin film is made d (μm), said bank is formed so as to satisfy a relationship $d/2 < b < 5d$.
2. (Amended) The patterning substrate according to claim 1, ~~characterized in that~~ said banks are being formed so as to satisfy relationship $a > d/4$.
3. (Twice Amended) The thin film element according to claim 1, ~~characterized in that~~ said banks are being formed so as to satisfy a relationship $c > t_0$ (where t_0 (μm) is film thickness of the thin film layer).
4. (Twice Amended) The thin film patterning substrate according to claim 1, ~~characterized in that~~ said banks are being formed so as to satisfy relationship $c > d/2b$.
5. (Twice Amended) The thin film patterning substrate according to claim 1, ~~characterized in that~~ further comprising: at least upper surfaces of said banks are being formed of an organic substance.
6. (Twice Amended) The thin film patterning substrate according to claim 1, ~~characterized in that~~ further comprising: upper surfaces and side surfaces of said banks are being formed of an organic substance.

7. (Twice Amended) The thin film patterning substrate according to claim 1, ~~characterized in that further comprising:~~ said banks ~~are being~~ formed in two layers ~~comprising including~~ a lower-layer inorganic substance and an upper-layer organic substance.

8. (Amended) The thin film patterning substrate according to claim 7, ~~characterized in that further comprising:~~ said banks ~~are being~~ formed in two layers ~~comprising including~~ a lower-layer inorganic substance and an upper-layer organic substance, and at least side surfaces of said inorganic substance are not covered by said organic substance.

9. (Twice Amended) The thin film patterning substrate according to claim 1, ~~characterized in that further comprising:~~ said areas to be coated ~~are being~~ of an inorganic substance.

10. (Twice Amended) The thin film patterning substrate according to claim 1, ~~characterized in that further comprising:~~ upper surfaces of upper portions of said banks ~~have~~ having liquid droplet reservoir structures.

11. (Twice Amended) The thin film patterning substrate according to claim 5, ~~characterized in that further comprising:~~ surface treatment ~~is being~~ performed so that an angle of contact of the organic substance surface forming said banks is 50° or greater, an angle of contact with the inorganic substance forming said banks is 20° to 50°, and an angle of contact of surfaces of said areas to be coated with said thin film liquid material is 30° or greater.

12. (Amended) The thin film patterning substrate according to claim 11, ~~characterized in that further comprising:~~ said surface modification ~~is being~~ effected by plasma treatment.

13. (Twice Amended) A thin film formation method for forming patterns of thin films by an ink jet method, comprising: using the thin film patterning substrate cited in claim 1.

15. (Amended) The thin film element according to claim 14, ~~characterized in that~~ comprising: said thin film element ~~is-being~~ an organic EL element wherein organic thin films having light-emission colors selected from among red, green, and blue are independently patterned.

16. (Amended) The thin film element according to claim 14, ~~characterized in that~~ said thin film element ~~is-being~~ a color filter wherein organic thin films that transmit only light-emission selected from among red, green, and blue are independently patterned.

17. (Twice Amended) A display device, comprising: a thin film element cited in claim 1.

18. (Amended) An electronic display unit, comprising: the display device cited in claim 17 and a circuit device for said display device.

19. (Amended) A thin film patterning substrate, used for forming thin films in patterns by a dip process or spin-coating process, ~~on~~ comprising:

a surface whereof are formed banks of a prescribed height and areas to be coated, partitioned by said banks; ~~and characterized in that:~~

at least surfaces of said banks are having surfaces being formed of an organic substance, and said areas to be coated are formed of an inorganic substance.

20. (Amended) A thin film patterning substrate, used for forming thin films in patterns by a dip process or spin-coating process, ~~on~~ comprising: a surface whereof are formed banks of a prescribed height and areas to be coated, partitioned by said banks; ~~and characterized in that:~~

~~upper surfaces and side surfaces of said banks are having upper surfaces and side surfaces being~~ formed of an organic substance, and said areas to be coated are formed of an inorganic substance.

21. (Amended) A thin film patterning substrate, used for forming thin films in patterns by a dip process or spin-coating process, ~~on comprising:~~

a surface whereof are formed banks of a prescribed height and areas to be coated, partitioned by said banks; ~~characterized in that:~~

said banks are being formed in two layers comprising including a lower-layer inorganic substance and an upper-layer organic substance, and said areas to be coated are formed of an inorganic substance.

22. (Amended) The thin film patterning substrate according to claim 21, ~~characterized in that at least further comprising: said banks having side surfaces of a lower layer of said banks are not covered by said organic substance.~~

23. (Twice Amended) The transistor patterning substrate according to claim 19, ~~characterized in that further comprising:~~

a surface treatment is being performed so that an angle of contact of the organic substance surface forming said banks is 50° or greater, an angle of contact with the inorganic substance forming said banks is 20° to 50°, and an angle of contact of surfaces of said areas to be coated with said thin film liquid material is 30° or less.

24. (Amended) The thin film patterning substrate according to claim 23, ~~characterized in that said surface modification is treatment being effected by plasma treatment.~~

26. (Amended) The thin film formation method according to claim 25, ~~characterized in that value of surface tension of comprising: using a liquid material used in~~

said dip process or said spin-coating process, is having a surface tension of 30 dyne/cm or less.

28. (Amended) A display device, comprising: the thin film element cited in claim 27.

29. (Amended) An electronic display unit, comprising: the display device cited in claim 28 and an electronic circuit for said display device.

30. (Amended) A thin film formation method for filling areas enclosed by banks with a liquid thin film material to form thin film layers, comprising:

~~a bank formation process for forming said banks of an organic material on a bank formation surface configured of an inorganic material;~~

~~a surface treatment process for performing a prescribed surface treatment on said banks and said bank formation surface under certain conditions wherewith, when said surface treatment has been performed, a degree of non-affinity for said liquid thin film material exhibited by said organic material becomes higher than that exhibited by said inorganic material; and~~

~~a thin film layer formation process for filling areas enclosed by banks subjected to said surface treatment with said liquid thin film material to form thin film layers.~~

31. (Amended) The thin film formation method according to claim 30, ~~characterized in that further comprising:~~ said surface treatment is a reduced-pressure plasma treatment wherewith plasma irradiation is conducted in a reduced-pressure atmosphere, using as induction gas, a gas containing fluorine or a fluorine-based compound.

32. (Amended) The thin film formation method according to claim 30, ~~characterized in that further comprising:~~ said surface treatment is an atmospheric-pressure plasma treatment wherewith plasma irradiation is conducted in an atmospheric-pressure atmosphere, using as induction gas, a gas containing fluorine or a fluorine-based compound.

33. (Twice Amended) The thin film formation method according to claim 31, ~~characterized in that further comprising:~~ said certain conditions are being that quantity of said fluorine-based compound is greater than that of oxygen.

34. (Amended) The thin film formation method according to claim 33, ~~characterized in that further comprising:~~ said certain conditions are that quantity of said fluorine-based compound contained is set at 600 or less of total quantity of fluorine-based compound and oxygen.

35. (Twice Amended) The thin film formation method according to claim 31, ~~characterized in that further comprising:~~ said gas used containing fluorine or a fluorine-based compound is a halogen gas such as CF₄, SF₆, or CHF₃.

36. (Amended) The thin film formation method according to claim 30, ~~characterized in that further comprising:~~ conditions for said surface treatment are set so that an angle of contact of said liquid thin film material for with said bank formation surface becomes 20 degrees or less.

37. (Amended) The thin film formation method according to claim 30, ~~characterized in that further comprising:~~ conditions for said surface treatment are set so that an angle of contact of said liquid thin film material for with said bank formation surface becomes 50 degrees or greater.

38. (Amended) The thin film formation method according to claim 30, ~~characterized in that further comprising:~~ said bank formation process forms-forming said banks into two layers, ~~comprising~~ including an upper layer and a lower layer.

39. (Amended) The thin film formation method according to claim 38, ~~characterized in that said bank formation method comprises~~ further comprising:
a lower layer film formation process for forming a lower layer film on said bank formation surface;

~~an upper layer formation process for forming an upper layer on said lower layer film in conformity with areas wherein said banks are formed;~~ and

~~a removal process for etching and removing said lower layer film from areas where said upper layer is not provided, using said upper layer as a mask.~~

40. (Amended) The thin film formation process according to claim 38, ~~characterized in that said bank formation process comprises further comprising:~~

~~a lower layer film formation process for forming a lower layer film on said bank formation surface;~~

~~a process for exposing and developing said lower layer film in conformity with areas wherein said lower bank layer is formed;~~

~~an upper layer film formation process for forming an upper layer film that covers said lower layer;~~ and

~~a process for exposing and developing said upper layer film in conforming with areas where said upper bank layer is formed.~~

41. (Amended) The thin film formation method according to claim 38, ~~characterized in that further comprising:~~ said surface treatment ~~sets~~ setting affinity for said liquid thin film material in said lower bank layer at or below that of said pixel electrode and at or above that of said upper bank layer.

42. (Amended) The thin film formation method according to claim 38, ~~characterized in that further comprising:~~ conditions of said surface treatment ~~are being~~ set so that a surface of said upper bank layer subtends an angle of contact with said liquid thin film material of 50 degrees or greater.

43. (Amended) The thin film formation method according to claim 38, ~~characterized in that further comprising:~~ conditions of said surface treatment ~~are being~~ set so

that surface of said lower bank layer subtends an angle of contact with said liquid thin film material that is within a range of 20 to 40 degrees.

44. (Twice Amended) The thin film formation method according to claim 30, ~~characterized in that further comprising:~~ pixel electrodes ~~are being~~ provided in areas enclosed by said banks, and said liquid thin film material is an organic semiconductor material for forming a thin film light emitting element.

45. (Amended) The thin film formation method according to claim 44, ~~characterized in that said pixel electrodes are being~~ ITO electrode films.

46. (Amended) The thin film formation method according to claim 30, ~~characterized in that said banks are of being~~ an insulating organic material such as a polyimide.

47. (Amended) The thin film formation method according to claim 38, ~~characterized in that said lower bank layer is either being one of~~ a silicon oxide film, a silicon nitride film, or amorphous silicon.

49. (Amended) A surface modification method for filling areas enclosed by banks formed on a substrate with a liquid thin film material, comprising:

~~a first process for performing a first process of~~ an oxygen gas plasma treatment on said substrate whereon said banks are formed; and

~~a second process for performing thereon, consecutively, after said first process, a second process of~~ a fluorine-based gas plasma treatment.

50. (Amended) The surface modification method according to claim 49, ~~characterized in that further comprising:~~

the plasma treatment in at least either said first process or said second process is an atmospheric-pressure plasma [treatment] conducted under atmospheric pressure.

51. (Amended) The surface modification method according to claim 49, ~~characterized in that further comprising:~~

the plasma treatment in at least either said first process or said second process is a reduced-pressure plasma [treatment] conducted under reduced pressure.

52. (Amended) A surface modification method for filling areas enclosed by banks formed on a substrate with a liquid thin film material, comprising:

~~a process for performing a process of~~ a fluorine-based gas plasma treatment on said substrate whereon said banks are formed.

53. (Amended) The surface modification method according to claim 52, ~~characterized in that further comprising:~~

said plasma treatment is a reduced-pressure plasma [treatment] performed under reduced pressure.

54. (Twice Amended) The surface modification method according to claim 49, ~~characterized in that said substrate is being~~ an inorganic substance.

55. (Twice Amended) The surface modification method according to claim 49, ~~characterized in that, in said banks formed on said substrate, at least an upper surfaces surface~~ of said banks ~~are being~~ formed of an organic substance.

56. (Twice Amended) The surface modification method according to any claim 49, ~~characterized in that, in said banks formed on said substrate, an upper surfaces surface~~ and side surfaces of said banks ~~are being~~ formed of an organic substance.

57. (Twice Amended) The surface modification method according to claim 49, ~~characterized in that, in said banks formed on said substrate, further comprising: said banks~~ ~~are being~~ formed in two layers ~~comprising including~~ a lower layer inorganic substance and an upper layer organic substance.

58. (Twice Amended) The surface modification method according to claim 49, ~~characterized in that, in said banks formed on said substrate, further comprising:~~ said banks are being formed in two layers comprising including a lower layer [in]organic-inorganic substance and an upper layer organic substance, and at least side surfaces of said inorganic substance are not covered by said organic substance.

59. (Amended) The surface modification according to claim 54, ~~characterized in that said~~ substrate surface formed of said inorganic substance is made to exhibit liquid affinity.

60. (Twice Amended) The surface modification method according to claim 55, ~~characterized in that surfaces~~ a surface of said organic substance forming said banks are being made to exhibit liquid repellency.

61. (Amended) The surface modification according to claim 60, ~~characterized in that surfaces~~ the surface of said organic substance forming said banks are being Teflon-treated.

62. (Twice Amended) The surface modification method according to claim 49, ~~characterized in that surfaces~~ a surface of said organic substance forming said banks are being made to exhibit liquid repellence, and a surface of said substrate formed of said inorganic substance is made to exhibit liquid affinity.

63. (Amended) The surface modification method according to claim 59, ~~characterized in that an~~ angle of contact of said liquid thin film material for said substrate surface is being 30 degrees or less.

64. (Amended) The surface modification method according to claim 60, ~~characterized in that an~~ angle of contact of said liquid thin film material for surfaces of organic substance forming said banks is being 50 degrees or greater.

65. (Amended) The surface modification method according to claim 62, ~~characterized in that an~~ angle of contact of said liquid thin film material for said substrate surface is 30 degrees or less, and for surfaces of organic substance forming said banks ~~is-
being~~ 50 degrees or greater.

66. (Twice Amended) The surface modification method according to claim 49, ~~characterized in that an~~ angle of contact of said liquid thin film material for said substrate surface is 30 degrees or less, for surfaces of a lower layer forming said banks is 20 to 50 degrees, and for ~~a surfaces~~ surface of an organic substance forming said upper bank layer is 50 degrees or greater.

67. (Twice Amended) A thin film formation method for filling areas enclosed by banks formed on a substrate with a liquid thin film material and forming a thin film, comprising:

~~a process for filling~~ said areas enclosed by ~~said~~ said banks on said substrate subjected to surface modification as cited in claim 49 with said liquid thin film material by an ink jet method, immediately after said surface modification.

68. (Twice Amended) A thin film formation method for filling areas enclosed by banks formed on a substrate with a liquid thin film material and forming a thin film, comprising:

~~a process for filling~~ said areas enclosed by ~~said~~ said banks on said substrate subjected to surface modification as cited in claim 49 with said liquid thin film material by a spin-coating method or dip method, etc., immediately after said surface modification.

70. (Amended) The display device according to claim 69, ~~characterized in that~~ said display device ~~is-being~~ a color filter.

71. (Amended) The display device according to claim 69, ~~characterized in that~~ said display device ~~is-being~~ an organic EL element.

72. (Twice Amended) A manufacturing method for a display device, ~~wherein a~~ thin film or films ~~are being~~ formed by the thin film formation method cited in claim 67.

73. (Amended) The display device manufacturing method according to claim 69, ~~characterized in that said display device is being~~ a color filter.

74. (Amended) The display device manufacturing method according to claim 69, ~~characterized in that said display device is being~~ an organic EL element.

75. (Amended) The patterning substrate according to claim 1, ~~characterized in that a~~ horizontal shape of portions enclosed by said banks ~~is being~~ circular or elliptical.

76. (Amended) A thin film patterning substrate having a substrate and banks formed on said substrate in a prescribed pattern, ~~characterized in that openings in said banks are being~~ formed in a ring shape.

77. (Amended) The patterning substrate according to claim 76, ~~characterized in that openings in said banks are being~~ formed in a circular or elliptical shape.

78. (Amended) An EL element having a substrate, banks of a prescribed pattern shape formed on said substrate, and thin films of a light emitting material in areas enclosed by said banks, ~~characterized in that a~~ shape of openings in said banks ~~is being~~ formed in a ring shape.

79. (Amended) The EL element according to claim 78, characterized in that a shape of an opening in said ring shape is circular or elliptical.

80. (Amended) A surface modification method for filling areas enclosed by banks in a substrate with a liquid thin film material, ~~characterized in that comprising:~~

performing a series of surface modification treatments ~~is performed~~ uniformly over an entire surface of said substrate whereon said banks are formed; and

raising a non-affinity of bank surfaces for said liquid thin film material ~~is raised~~ relative to that of surfaces between said banks.